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Houmura et al.

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[54] PULLER APPARATUS FOR AN EXTRUSION MACHINE

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[5] **B21C 35/02**

[52] **U.S. Cl.** **72/257**

[58] **Field of Search** 72/255, 257

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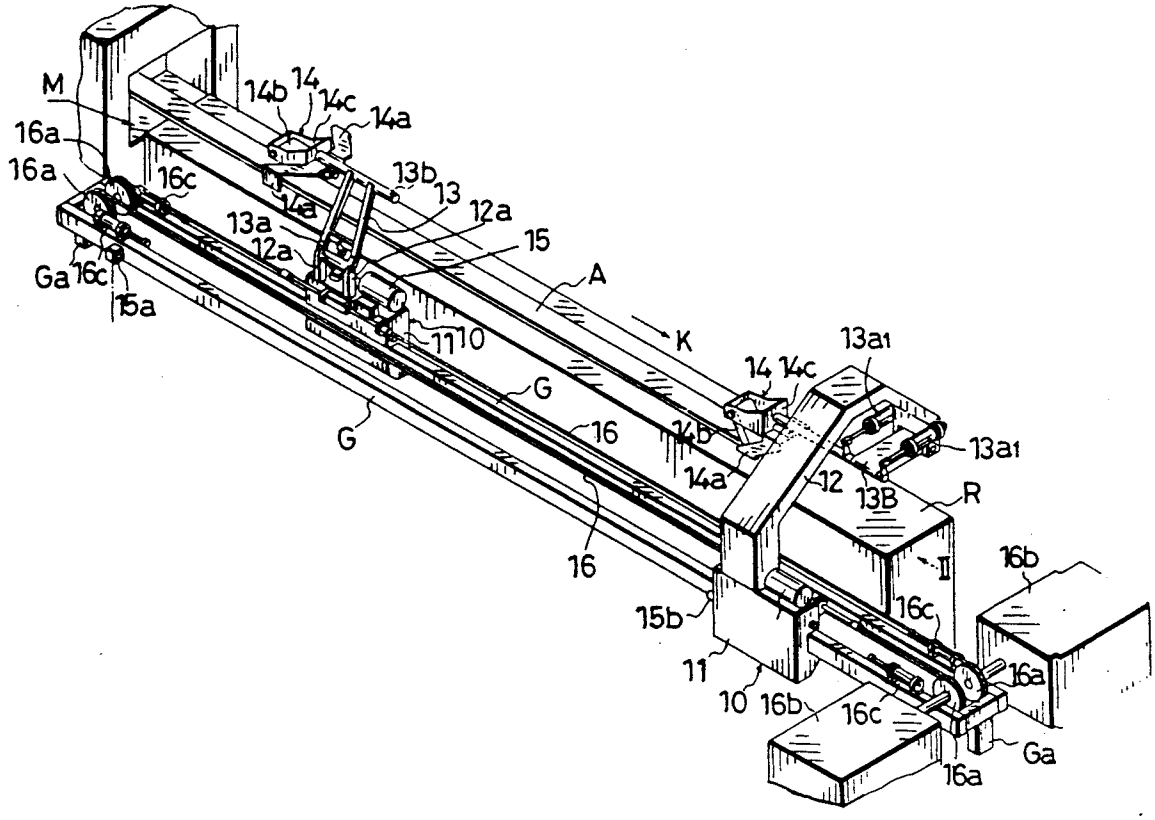
Primary Examiner—Lowell A. Larson

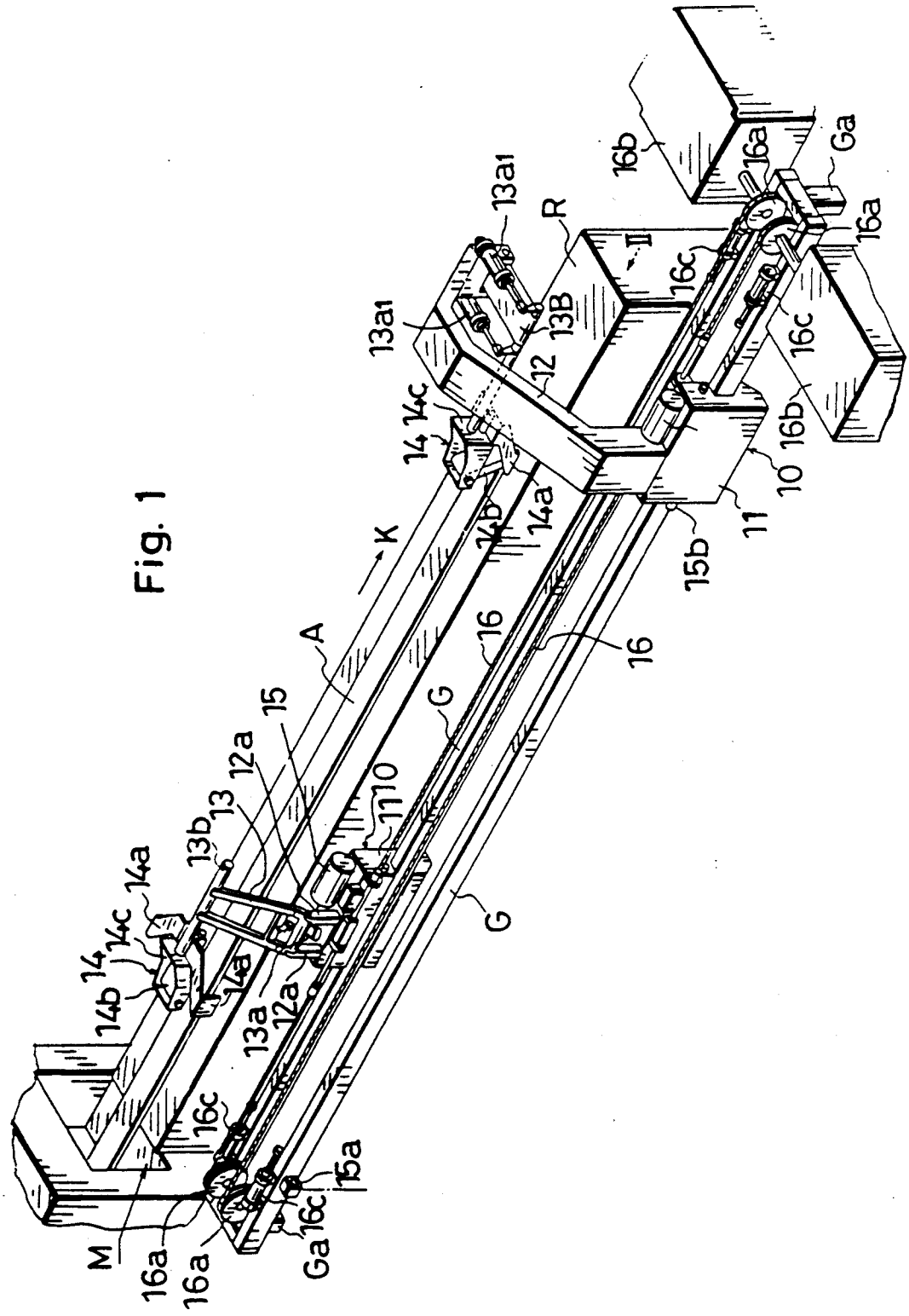
Attorney, Agent, or Firm—Morrison Law Firm

[57] **ABSTRACT**

Apparatus for pulling metal extruded from an extrusion machine has a pair of carriers mounted on one side and below the surface of a runout table. Each carrier moves on a rail parallel to the table. One carrier in an operative position does not interfere with the other in a retracted position when they pass each other. Production efficiency is improved by using the carriers alternately. With the rails below the level of the table surface, space above the runout table can accommodate apparatus to cool the extruded metal.

7 Claims, 8 Drawing Sheets

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16c
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13B
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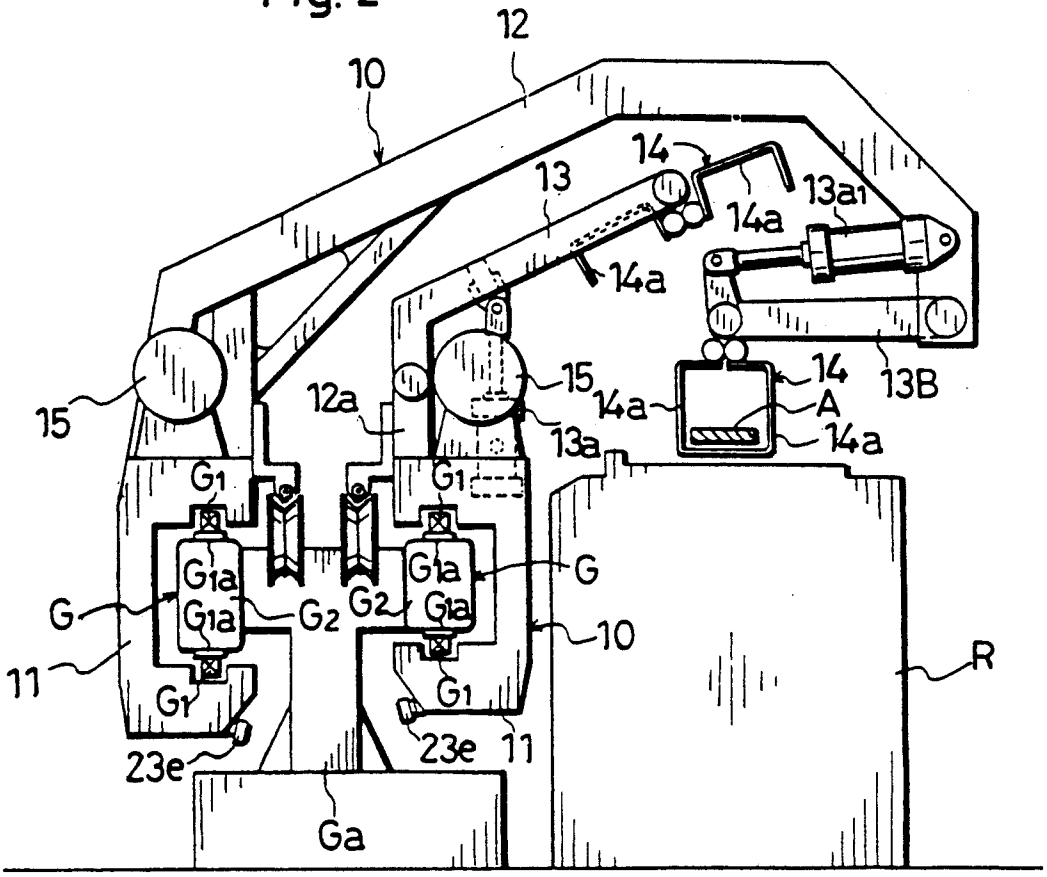
11
K
14b
15b
A
16
16
15
G
12a
13
13b
10
14a
14c
14
14b
G
14a
13a
12a
16c
15a
M
16a
16a
Ga
16c

Fig. 1

Fig. 2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10
14
13
13a1
14a
14a
15
12a
15
14a
14
A
14a
13B
13a
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G1
G1a
G1a
G
G
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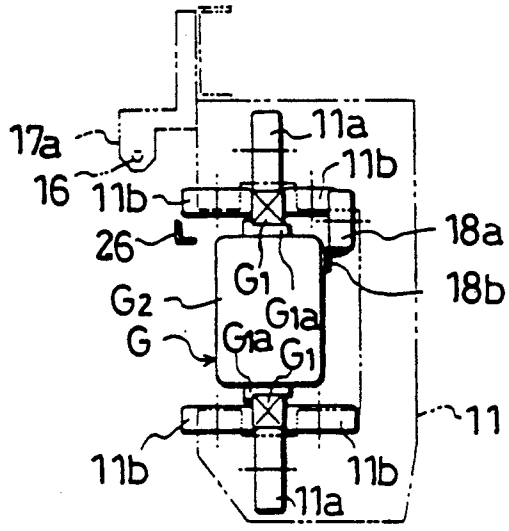
G1
23e
23e
11
Ga

Fig. 3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16
11a
11b
11b
18a
26
18b
G1
G2
G1a
G
G1a
G1
11
11b
11b
11a

Fig. 4A

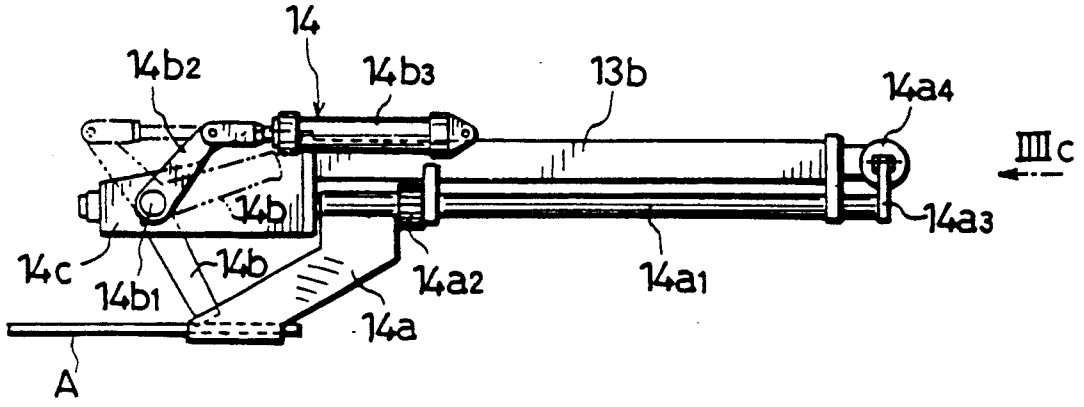


Fig. 4B

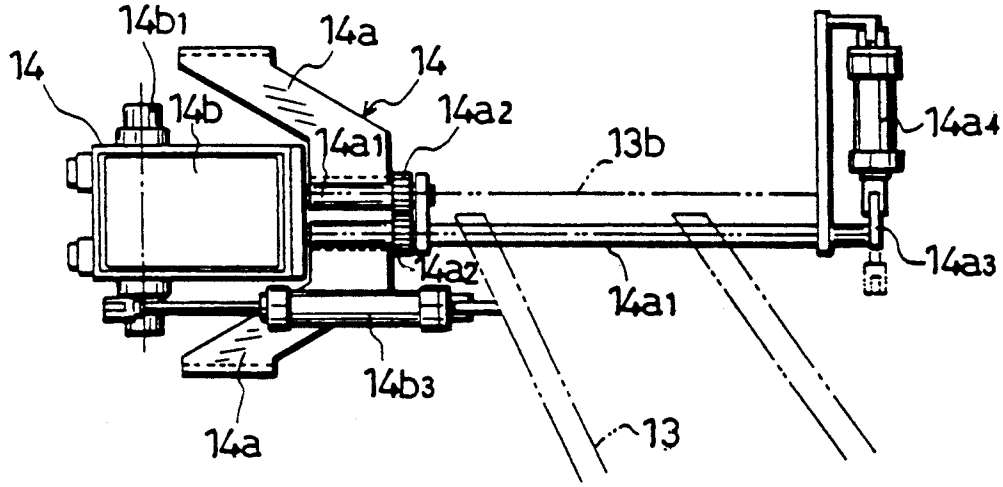


Fig. 4C

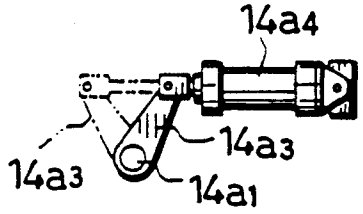


Fig. 5

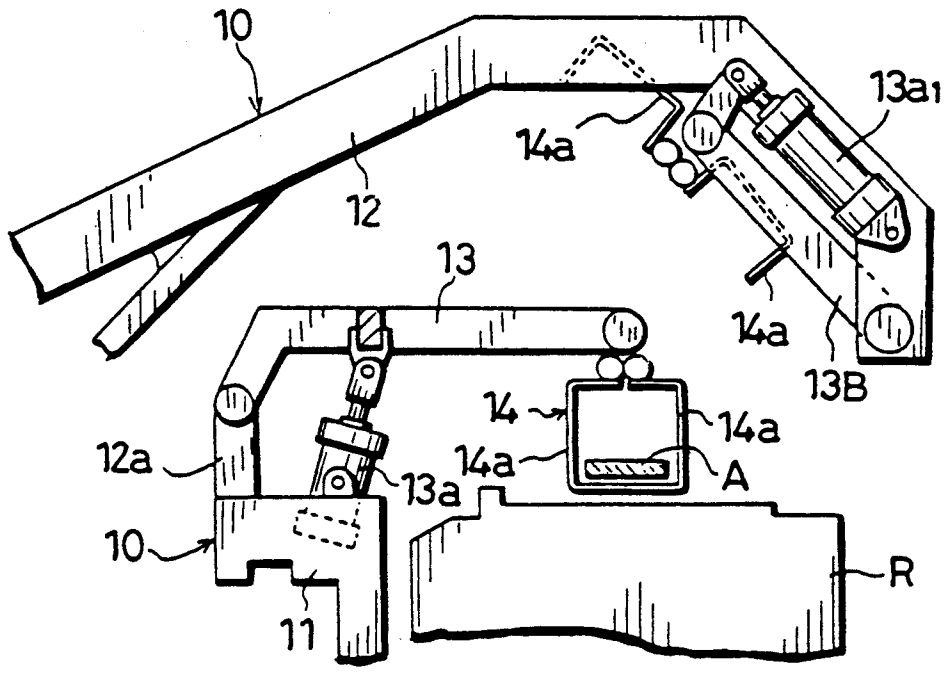

10
12
13
13a1
14a
14a
13B
14
14a
14a
A
12a
13a
10
11
R

Fig. 7

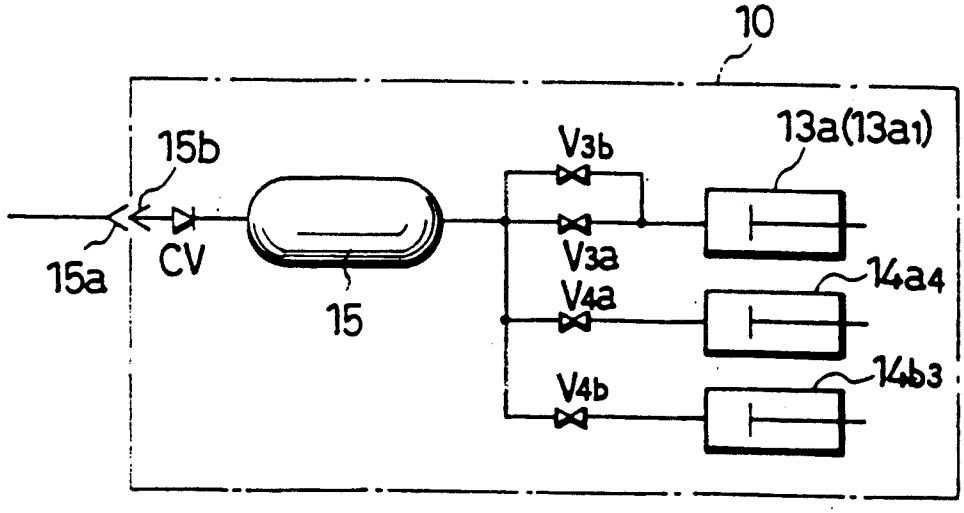
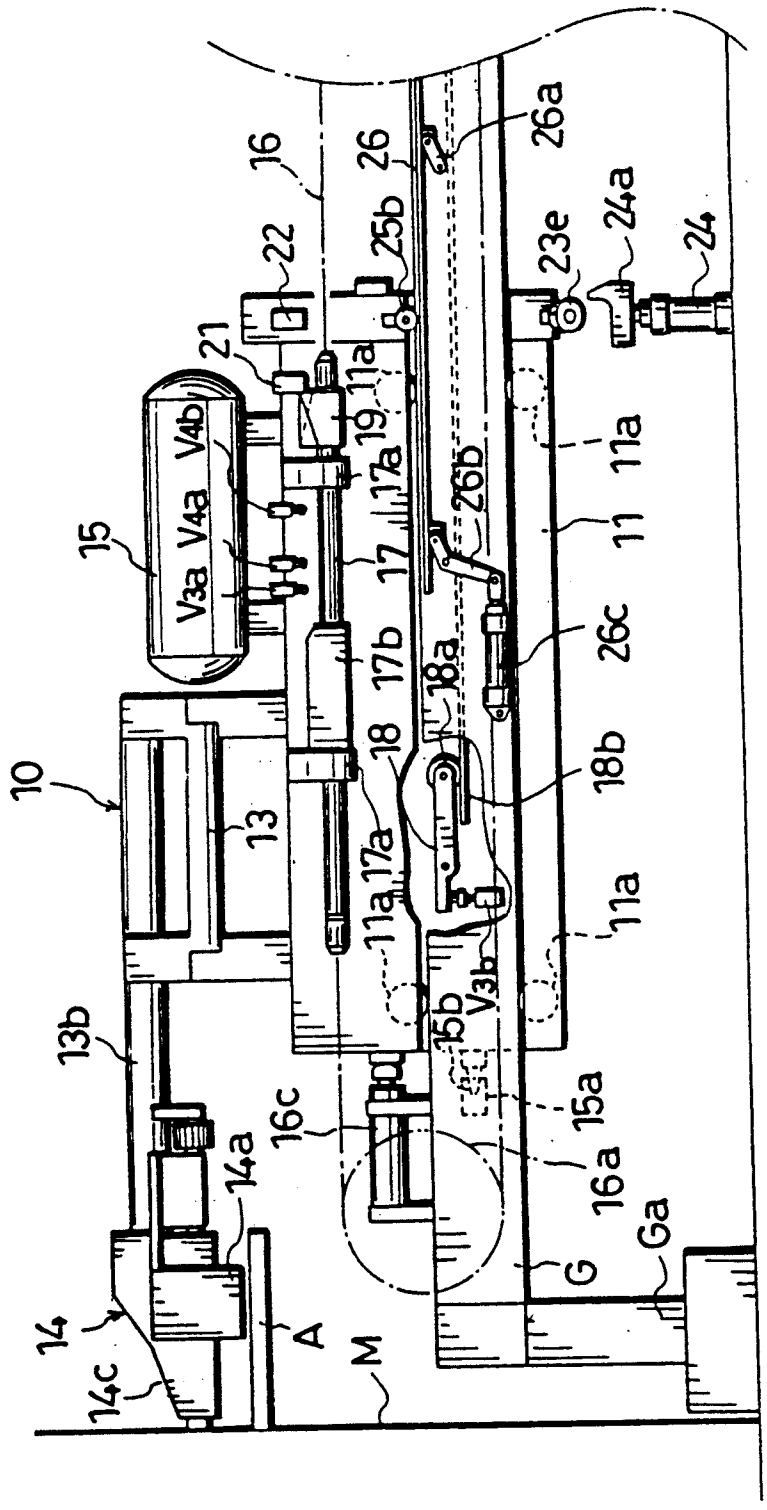

10
15b
15a
CV
15
V3b
V3a
V4a
V4b
13a(13a1)
14a4
14b3

Fig. 6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26
26a
22
25b
23e
24a
24
21
11a
19
17a
26b
11
11a
15
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V4a
V4b
17
17b
18a
26c
18
18b
10
13
11a
17a
11a
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13b
16c
15a
14a
16a
G
Ga
14
A
M
14c

Fig. 8

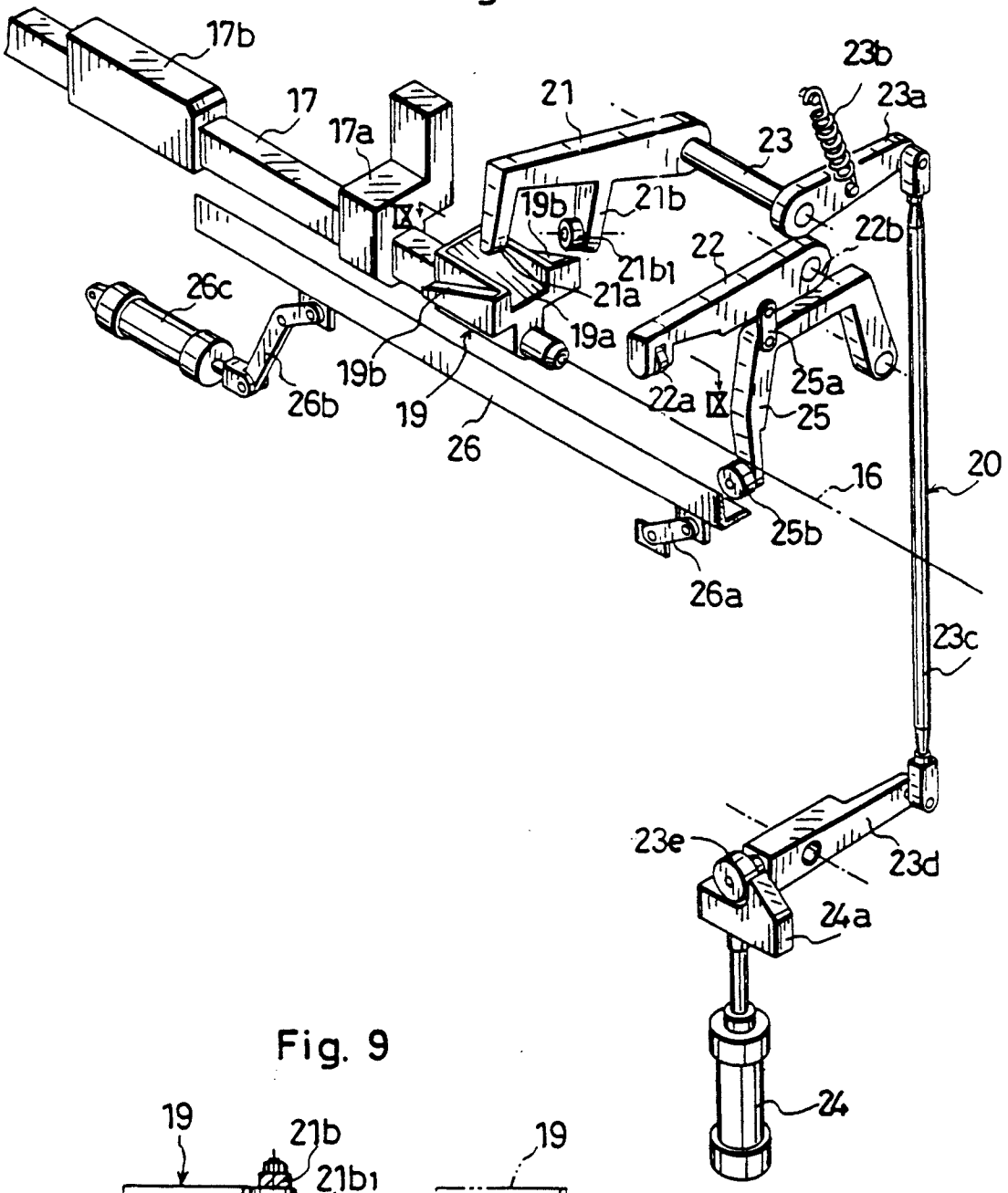

17b
17
17a
21
23b
23a
23
19b
21b
22b
21b1
22
26c
21a
19a
19b
26b
19
26
22a
25a
25
16
20
25b
26a
23c
23e
23d
24a
24

Fig. 9

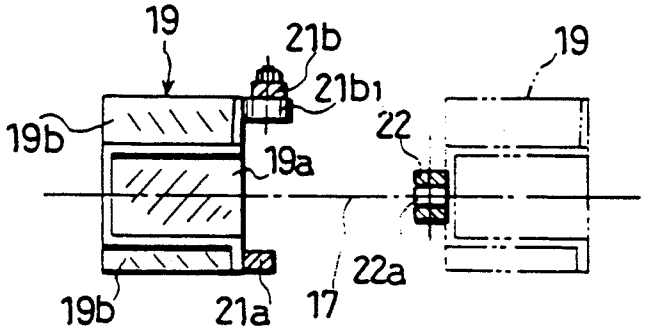
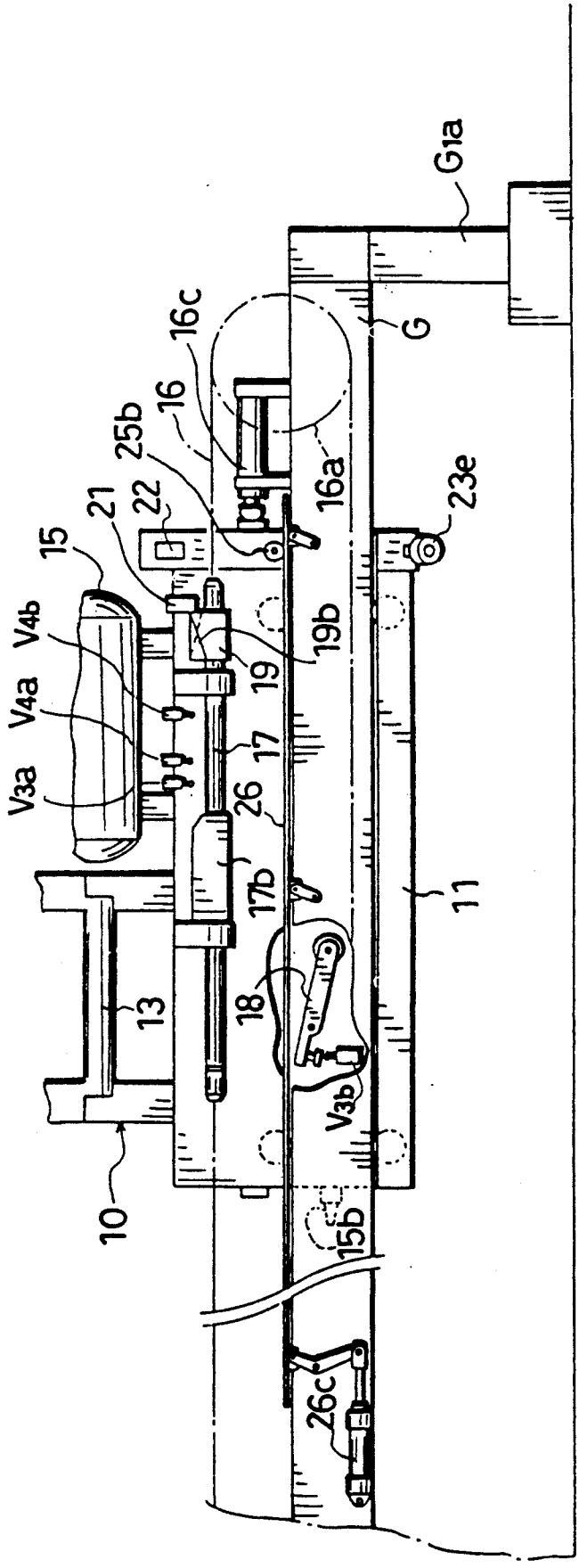

19
21b
21b1
19
19b
22
19a
22a
19b
21a
17

Fig. 10


G1a
G
16c
16
25b
22
21
15
16a
23e
V4b
V4a
V3a
19b
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17b
11
13
18
V3b
10
15b
26c

Fig. 11

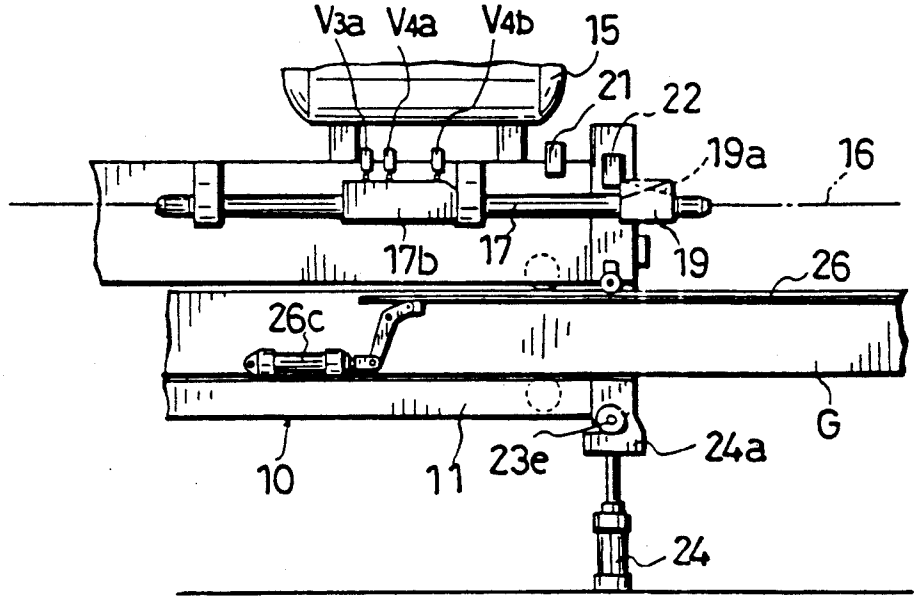
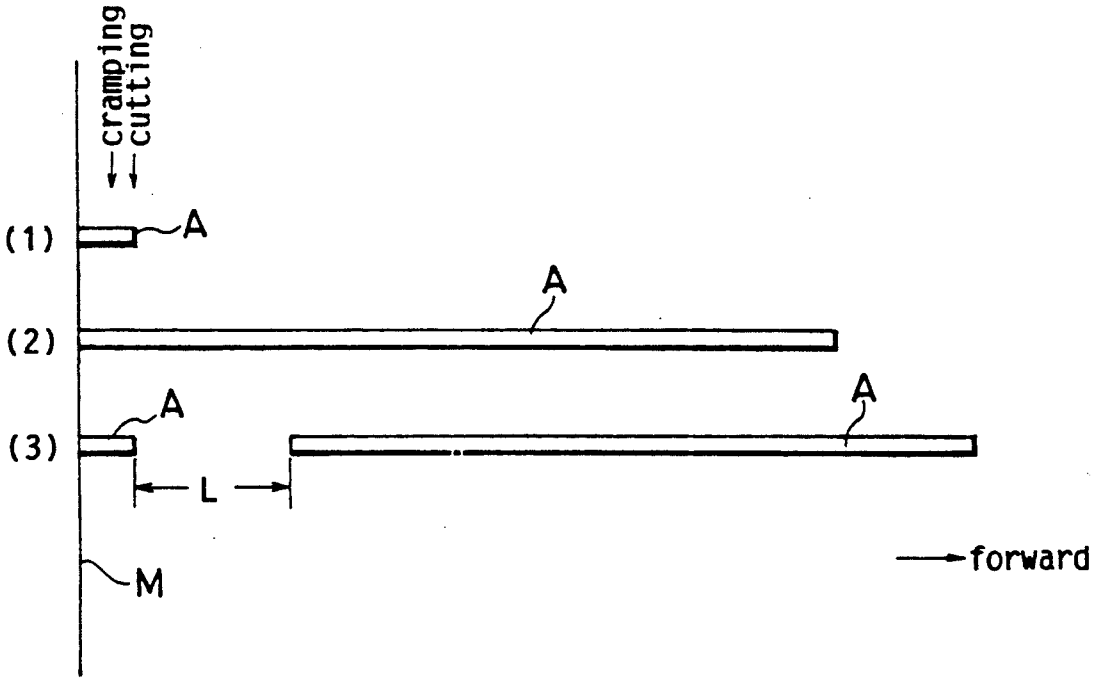

V3a
V4a
V4b
15
21
22
19a
16
17b
17
19
26
26c
G
10
11
23e
24a
24

Fig. 12


cramping
cutting
(1)
A
(2)
A
(3)
A
A
L
M
forward

PULLER APPARATUS FOR AN EXTRUSION MACHINE

BACKGROUND ART

The present invention relates to a puller apparatus installed behind a metal extrusion press.

In order to prevent bending or torsion of an extruded metal which is formed by the metal extrusion press, a puller apparatus is typically provided behind a metal extrusion press (hereinafter simply referred to as an extrusion machine) to pull such an extruded metal by a constant tractional force.

A conventional puller apparatus includes one carrier per extrusion machine. When an extruded metal is conveyed onto a runout table, the carrier can clamp the front end of the extruded metal and pull it in a forward direction. A recent extrusion machine provides two carriers for improving extrusion speed, and using a longer runout table to convey a very long extruded metal. To this end, the two carriers are alternately operated to reduce the rest time of the extrusion machine.

Such a puller apparatus typically includes a pair of guide rails mounted on one side of a runout table, and subrails are employed to connect opposite ends of the guide rails. Two carriers are alternately moved around and on the guide rails (Japanese utility model publication No. 55-7284). Another known puller apparatus includes a pair of guide rails above a runout table. Carriers are hung on the guide rails. Only clamps of the carriers are alternately moved to its operative position on the runout table (Japanese utility model publication No. 59-22883).

In the former prior art, since the opposite ends of guide rails are connected through the subrails, the carriers must be moved from one of the guide rails to the other rail via the subrails. The carriers are moved in two different directions on the guide rails and subrails, so that they do not complicate the drive system. Also, the carrier has to be advanced to its foremost position where the subrail is provided independent of the length of a metal to be extruded. This results in loss of time during an operation cycle.

A disadvantage of the latter prior art is that the guide rails interface with the view above the runout table for operating the puller apparatus. And a space must be available on the runout table to enable movement of the carriers, but this arrangement prevents installation of a cooling fan adapted to cool an extruded metal.

OBJECT OF THE INVENTION

In view of the foregoing, it is an object of this invention to provide a puller apparatus for an extrusion machine which enables provision of a simple drive system adapted to drive carriers, which minimizes the required movement of the carriers in accordance of the length of an extruded metal, and which provides a full open space above a runout table.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing the overall structure of a puller apparatus according to one embodiment of the present invention;

FIG. 2 is a side view of the puller apparatus as seen in the direction of the arrow II in FIG. 1:

FIG. 3 is an enlarged view showing the principal part of the apparatus shown in FIG. 2;

FIG. 4A is a side view of a clamp head shown in FIG. 1;

FIG. 4B is a plan view of the clamp head shown in FIG. 4A;

FIG. 4C is a view of the clamp head as seen in the direction of the arrow IIIIC in FIG. 4A:

FIG. 5 is an enlarged view showing the principal part of the puller system in FIG. 1;

FIG. 6 is a side view showing the manner in which the carrier of FIG. 2 is moved to its rearmost position;

FIG. 7 is a schematic view of an air supply system for use in the carrier shown in FIG. 1;

FIG. 8 is a perspective view showing the principal part of the carrier shown in FIG. 1;

FIG. 9 is a sectional view taken along the line IX—IX of FIG. 8;

FIG. 10 is a side view showing the manner in which the carrier of FIG. 2 is moved to its foremost position:

FIG. 11 is a side view showing the manner in which the carrier of FIG. 1 is operated; and

FIG. 12 is a view showing the manner in which an extruded metal is pulled.

DETAILED DESCRIPTION OF THE INVENTION

As shown in FIG. 1, a puller apparatus for an extrusion machine includes runout table R, a pair of guide rails G, G mounted on one side of the runout table R, and a pair of corresponding carriers **10**, **10** are provided on the guide rails G,G.

The runout table R is elongated and located behind an extrusion machine M. An extruded metal A is fed from the extrusion machine M and received on the runout table R. The supplying base end of the extruded metal A is cut by a cutter (not shown). A piece of the extruded metal A thus cut is first dropped onto the runout table R and then, delivered to the other side of the runout table R.

The guide rails G, G are supported on suitable bases Ga, Ga and extend in parallel to the runout table R. As shown in FIG. 2, each guide rail G includes an elongated structural element G2, and a pair of rail bodies G1, G1 attached to the structural element G2 through a pair of corresponding spacers G1a, G1a.

The carriers **10**, **10** are movable on the guide rails G, G.

The carrier **10** movable on the guide rail G closer to the runout table R comprises a movable frame **11**, a pair of rod-link supports **12***a*, **12***a*, a swing base **13** pivotably mounted to the front end of the supports **12***a*, **12***a*, and a clamp head **14** attached to the end of swing base **13**. As shown in FIG. 3, the movable frame **11** is movably supported by the rail bodies G1, G1 through vertical rollers **11***a* and horizontal rollers **11***b*, **11***b*. An air tank **16** is placed on the movable frame **11** (FIGS. 1 and 2). The swing base **13** is vertically swingable relative to the movable frame **11** by means of an air cylinder **13***a*.

The clamp head **14** is mounted through a support rod **13***b* to the front ends of the swing base **13** and generally horizontally extends in a rearward direction (toward the extrusion machine M; see FIG. 1. A forward direction is shown by the arrow K in FIG. 1. A rearward direction is a direction opposite to the forward direction. As shown in FIGS. 4A and 4B, the clamp head **14** includes a pair of right and left jaws **14***a*, **14***a*, a finger **14***b*, and a frame **14***c* designed to contain the finger **14***b*.

The jaws **14***a*, **14***a* are pivotable about a pair of pivot pins **14***a*1, **14***a*1 below the frame **14***c*. A pair of corre-

sponding gears **14***a*2, **14***a*2 are mounted on the pivot pins **14***a*1, **14***a*1 and engaged with one another. One of the pivot pins **14***a*1 extends forwardly from the gear **14***a*2 and has a front end connected to an air cylinder **14***a*4 through an arm **14***a*3. Upon contraction of the air cylinder **14***a*4, the jaws **14***a*, **14***a* are opened to their horizontal position (FIG. **4**B). When the air cylinder **14***a*4 is extended, the jaws **14***a*, **14***a* are pivoted downwardly and closed to form a box (FIG. **4**B).

The finger **14***b* is mounted to the frame **14***c* and pivotable about a pivot pin **14***b*1. An arm extends from one end of the pivot pin **14***b*1 and has a front end connected to an air cylinder **14***b*3. Contraction of the air cylinder **14***b*3 causes the finger **14***b* to pivot downwards (shown by a solid line in FIG. **4**A), whereas extension of the air cylinder **14***b*3 causes the finger **14***b* to pivot upwards (shown by a broken line in FIG. **4**A).

When the jaws **14***a*, **14***a* are closed, and the finger **14***b* is pivoted downwards, they cooperate to clamp the front end of the extruded metal A. The extruded metal A is unclamped when the finger **14***b* is pivoted upwards, and the jaws **14***a*, **14***a* are opened.

The carrier **10** mounted on the guide rail G remote from the runout table R is essentially identical in structure to the other carrier **10** (FIGS. **1** and **2**) except that a support **12** is a single elongate arm extending over the other carrier **10**. A swing base **13***b* is mounted to the inner side of the arm **12** and is vertically swingable by means of a pair of air cylinders **1**S*a*1, **1**S*a*1.

As shown in FIGS. **2** and **5**, the carriers **10**, **10** are positioned relative to one another so as not to interfere with one another. When the swing base **13** or **13***b* is pivoted upwards and the jaws **14***a*, **14***a* are laterally opened on one of carriers, the swing base **13** or **13**B is pivoted downwards and the jaws **14***a*, **14***a* of the other carrier **10** are closed. When the swing bases **13** or **13***b* is pivoted downwards, the clamp head **14** of the carriers **10**, **10** are identical in position on the runout table R. This position is coincident with the position in which the metal A is fed from the extrusion machine M.

The position of the clamp head **14** when the swing bases **13** or **13***b* is pivoted downwards is defined as an operative position. The position of the clamp head **14** when the swing bases **13** or **13**B is pivoted upwards is defined as a retracted position. One of the clamp heads **14** in its operative position never interferes with the other clamp head **14** in its retracted position.

The carriers **10**, **10** are moved along the entire length of the guide rails G, G forward and rearward by means of a pair of endless wires **16**, **16** (FIG. **1**). Each wire **16** extends around a pair of pulleys **16***a*, **16***a*. The front pulley **16***a* remote from the extrusion machine M is connected to a drive source **16***b* such as a hydraulic motor. A hydraulic damper **16***c* is located adjacent to each pulley **16***a* to limit movement of the carrier **10**. As an alternative, the front pulley **16***a* connected to the drive source **16***b* may be in the form of a drum.

A pair of couplers **15***a*, **16***a* are provided to limit rearward movement of each carrier **10** and connected to an air source (not shown). When the carrier **10** reaches its rearmost position, the air coupler **15***a* is automatically coupled to an air coupler **15***b* of the carrier **10** to replenish the air tank **15**. The air tank **15** has enough a volume to control operation at least until the carrier **10** is returned and may include a booster to compensate a decrease in the pressure of air.

As shown in FIG. **6**, the carrier **10** has a slide rod **17** through which opposite ends of the wire **16** is connected to form an endless wire. The slide rod **17** is slidable back and forth through a pair of bearing blocks **17***a*, **17***a*. A dog block **17***b* is secured to the slide rod **17**. Movement of the slide rod **17** is limited when the dog block **17***b* comes into contact with each bearing block **17***a*.

Three mechanical valves V**3***a*, V**4***a*, V**4***b* are located between the bearing blocks **17***a*, **17***a* and are rendered operative as the dog block **17***b* is advanced. The mechanical valves V**3***a*, V**4***a*, V**4***b* are disposed between the air tank **15** and the air cylinders **13***a* (or **13***a*1), **14***a*4, **14***b*3 (FIG. **7**). When the dog block **17***b* is advanced to operate the mechanical valves V**3***a*, V**4***a*, V**4***b*, the swing base **13** (or **13**B) is pivoted downwards to move the clamp head **14** to its operative position. Then, the jaws **14***a*, **14***a* are closed, and the finger **14***b* is pivoted downwards for clamping the extruded metal A.

As shown in FIG. **7**, a check valve CV is disposed between the air couplers **15***a*, **15***b* and the air tank **15**, another mechanical valve V**3***b* is coupled in parallel to the mechanical valve V**3***a*. And the valve V**3***b* is rendered operative by a swing arm **18** with an associated roller **18***a* which is mounted to the movable frame **11** (FIG. **6**). Specifically, the mechanical valve V**3***b* is rendered operative when the roller **18***a* of the swing arm **18** is engaged with a control rail **18***b*. The control rail **18***b* is attached to the guide rail G adjacent to the extrusion machine M or a position where the rearward movement of the carrier **10** is limited (FIGS. **3** and **6**).

As shown in FIG. **8**, a control block **19** is secured to the front end of the slide rod **17**. The movable frame **11** has a pair of stopper levers **21** and **22** engageable from the upper portion with the control block **19** and cooperative with a control mechanism to limit forward and rearward movements of the slide rod **17**. The stopper lever **21** has two arms **21***a* and **21***b*, a roller **21***b*1 is mounted to the arm **21***b*. Also, a roller **22***a* is mounted to the front end of the stopper lever **22**.

The control block **19** has a forwardly inclined central surface **19***a*, and rearwardly inclined side surfaces **19***b*, **19***b*. The arm **21***a* of the stopper lever **21** and the roller **21***b*1 of the other arm **21***b* work together with the inclined surfaces **19***b*, **19***b* so as to inhibit forward movement of the control block **19** (shown by a broken line in FIG. **9**).

As shown in FIG. **8**, a shaft **23** extends from the stopper lever **21**. An arm **23***a* extends from the shaft **23**. A spring **23***b* has one end connected to the arm **23***a*. Thus, the stopper lever **21** is always urged toward the control block **19**. A connecting rod **28***c* has one end connected to the front end of the arm **23***a* and the other end connected to one end of a swing arm **23***d*. A roller **23***e* is mounted to the other end of the swing arm **23***d*.

An vertical cylinder **24** (FIGS. **6** and **8**) corresponds in position to the roller **23***e* when the carrier **10** is moved to its rearmost position. The cylinder **24** has a rod, and an engaging element **24***a*is attached to the rod and adapted to engage with the roller **23***e*. When the rod is extended, the engaging element **24***a* is brought into engagement with the roller **23***e*. This inhibits forward movement of the carrier **10** in its position. Retraction of the rod allows the forward movement of the carrier **10**. When the cylinder is extended, the stopper lever **21** is pivoted upwards through the swing arm **23***d*, the connecting rod **23***c*, the arm **23***a*, and the shaft **23**. This causes release of the stopper level **21** from the control block **19**. When the cylinder **24** is contracted, the stopper lever **21** is brought into engagement with the con-

trol block **19** so as to inhibit forward movement of the control block **19**.

The stopper lever **22** is pivotable with a shaft **22***b* and is connected to another swing lever **25** through a connecting piece **25***a*. A roller **25***b* is mounted to the front end of swing lever **25**.

A movable rail **26** extends substantially along the entire length of the guide rail G (FIGS. **3**, **6** and **8**). Then roller **25***b* is lifted in a suitable position of the movable rail **26**. The movable rail **26** is vertically translated by a cylinder **26***c* through a plurality of links **26***a*. Only one of these links **26***a* is shown in FIGS. **6** and **8**. Extraction and contraction of the cylinder **26***c* cause vertical translational movement of the movable rail **26**. This results in corresponding pivotal movement of the stopper lever **22** to allow and inhibit rearward movement of the control block **19**.

Either one of the carriers **10** is moved to a position closest to the extrusion machine, and the other carrier **10** rests in a position corresponding to the length of a metal A to be produced.

When the carrier **10** is moved to its rearward position by the drive source **16***b* through the wire **16**, the slide rod **17** is in its rearmost position as a result of contact between the dog block **17***b* and the rear bearing block **17***a* as shown in FIG. **6**. At this time, the roller **18***a* of the swing arm **18** is placed on the control rail **18***b* to operate the mechanical valve V**3***b*, and the mechanical valves V**3***a*, V**4***a*, V**4***b* are rendered inoperative.

When the mechanical valve V**3***b* is operated, the swing base **13** (or **13B**) is pivoted downwards. The jaws **14***a*, **14***a* are laterally opened, and the finger **14***b* is pivoted upwards. The clamp head **14**, although in its operative position, does not clamp the extruded metal. Also, the cylinder **24** is contracted to pivot the stopper lever **21** downwards so as to inhibit forward movement of the control block **19** in its rearmost position. The cylinder **26***c* is contracted to lower the movable rail **26**. The air coupler **15***b* of the carrier **10** in its rearmost position is automatically coupled to the air coupler **15***a*. A sufficient amount of air is then supplied to the air tank **15**.

In the other carrier in a suitable forward position as shown in FIG. **10**, the slide rod **17** is in its rearmost position since the extruded metal A is unclamped. The mechanical valves V**3***b*, V**4***a*, V**4***b* are all rendered inoperative. Thus, the swing arm **13** (or **13B**) is pivoted upwards, and the clamp head **14** is in its retracted position. The jaws **14***a*, **14***a* are laterally opened, and the finger **14***b* is pivoted upwards. In order to unclamp the extruded metal A, the cylinder **26***c* is temporarily extended to lift the movable rail **26** and thus, the stopper lever **22**. The cylinder **26***c* may immediately thereafter be contracted.

As shown in FIG. **11**, the cylinder **24** is extended to provide an engagement between the engaging element **24***a* and the roller **23***e* so as to inhibit forward movement of the carrier **10**. The stopper lever **21** is pivoted upwards to allow forward movement of the control block **19**. The drive source **16***b* then applies a light tractional force to the wire **16**. This causes only the slide rod **17** to move in a forward direction, and the carrier is not moved. As a result the mechanical valves V**3***a*, V**4***a*, V**4***b* are rendered operative in this order. The jaws **14***a*, **14***a* are closed, and then, the finger **14***b* is pivoted downwards. This causes the clamp head **14** to clamp the front end of the metal A as fed from the extrusion machine M.

At this time, the control block **19** is moved, through its inclined surface **19***a*, beyond the stopper lever **22**. This prevents rearward movement of the control block **19** (FIG. **11**). As the mechanical valve V**3***b* is rendered operative by the control rail **18***b*, the swing base **13** (or **13B**) is pivoted downwards to move the clamp head **14** to its operative position.

Next, the cylinder **24** is contracted to allow forward movement of the carrier **10**. A predetermined amount of tractional force is applied from the drive source **16***b* to the wire **16**. When the extrusion machine M is operated, the carrier **10** is advanced at an extrusion speed of the metal A. During an extrusion process, the metal A is pulled constantly by a force identical to the predetermined tractional force exerted on the wire **16** (FIG. **12**(2)). When the carrier **10** is advanced, the air coupler **15***b* is automatically separated from the air coupler **15***a*. Air pressure is supplied from the air tank **15** to control the operation of the elements on the carrier **10**.

When the carrier **10** is moved beyond the entire length of the control rail **18***b*, the swing arm **18** is returned to render the mechanical valve V**3***b* inoperative. However, the mechanical valve V**3***a* is already operative to keep the clamp head **14** in its operative position.

When one of the carriers **10** initiates traction of the extruded metal A, the drive source **16***b* is operated to move the other carrier **10** toward the extrusion machine M through the corresponding wire **16**. Although the carriers **10**, **10** pass each other in a given position provided that they are separated from the corresponding control rails **18***b*, they do not interface with one another. This is because the clamp head **14** of the carrier **10** which is active to pull the extruded metal is in its operational position, whereas the clamp head **14** of the other carrier **10** is in its retracted position.

When a predetermined length of the extruded metal A is pulled, the extrusion machine M is temporarily stopped. The base end of the extruded metal A is then cut by a cutter not shown. The carrier **10** which is operating to pull the extruded metal is automatically stopped when the extrusion machine M is stopped. After the extruded metal A has been cut, the carrier **10** is advanced at a constant speed by a predetermined distance L (FIG. **12**(3)). This further pulls the extruded metal A.

In the meantime, the other carrier **10** reaches the area of the control rail **18***b*. The mechanical valve V**3***b* then forces the clamp head **14** to its operative position while the carrier **10** is being retracted. In this case, the extruded metal A as pulled does not interfere since the jaws **14***a*, **14***a* are opened. The carrier **10** is automatically stopped when it is moved to its rearmost position. The air couplers **15***a* and **15***b* are then automatically coupled together so as to replenish the air tank **15** with air.

The drive source is deenergized to stop the carrier **10** which has pulled the extruded metal A by the distance L. The air cylinder **26***c* is thereafter extended to lift the movable rail **26** (FIG. **10**). This causes the stopper lever **22** to pivot upwards to allow rearward movement of the control block **19**. The drive source **16***b* then moves the wire **16** in a rearward direction. This causes the slide rod **17** to move in a rearward direction, The mechanical valves V**4***b*, V**4***a*, V**3***a* are then returned to their inoperative condition in this order. As a result, the finger **14***b* is pivoted upwards to cause the clamp head **14** to unclamp the extruded metal A. Lateral opening the fingers results in dropping of the front end of the extruded metal A on the runout table R. The swing base **13** is pivoted upwards to move the clamp head **14** to its re-

tracted position. The carrier **10** is returned to its resting position.

When the slide rod **17** is retreated, the control block **19** is moved behind the stopper lever **21** through its inclined surfaces **19***b*, **19***b*. This inhibits forward movement of the control block **19**. As the movable rail **26** extends substantially along the entire length of the guide rail G, the extruded metal A can be unclamped without failure by means of the air cylinder **26***c* even if the position in which the carrier **10** is stopped is changed in response to the length of the metal A. As such, required forward movement of the carrier **10** can be minimized.

Next, the other carrier **10** in its rearmost position is similarly operated to pull the extruded metal A. Thereafter, the two carriers **10**, **10** are alternately used to substantially continuously produce the metal A.

The extruded metal A as pulled by the carrier **10** and dropped on the runout table R is laterally moved by a transfer mechanism (not shown) in a direction opposite to the guide rails G, G. When the carrier **10** is advanced, the speed of the carriers is limited by the speed at which the metal A is extruded. On the other hand, when the carrier **10** is retracted to pull the next metal A, the carrier **10** can be moved at any speeds by means of the drive source **16***b* and the wire **16**.

With the present invention thus far described, a pair of carriers are movable on a corresponding pair of guide rails mounted on one side of the runout table. When the carrier is advanced, the clamp head is in its operative position. When the carrier is retreated, the clamp head is in its retracted position so as not to interfere with the other clamp head in its operative position. Each carrier is moved back and forth on each single guide rail. This enables provision of a simple drive system. Since no subrails are employed, the movement of the carriers can be minimized in accordance with the length of a metal to be pulled. Advantageously, a full open space is available above the runout table to accommodate a cooling fan since no guide rail is placed above the runout table.

We claim:

1. A puller apparatus for an extrusion machine wherein extruded metal fed from an extrusion machine is pulled on a runout table while the metal is clamped by a clamp head, comprising:

a first guide rail and a second guide rail mounted on one side of said runout table and extending in parallel thereto;

a first carrier and a second carrier;

said first carrier being movable on said first guide rail;

said second carrier being movable on said second guide rail;

a first clamp head and a second clamp head;

a first support and a second support;

a first swing base and a second swing base;

said first clamp being mounted to said first carrier through said first support said first swing base;

said said second clamp head being mounted to said second carrier through said second support and said second swing base;

each of said first clamp head and said second clamp head being movable between an operative position and a retracted position;

said first carrier with said first clamp head in its operative position and said second carrier with said second clamp head in its retracted position being constructed so as not to interfere with one another when said first carrier and said second carrier are moved back and forth;

said first carrier with said first clamp head in its retracted position and said second carrier with said second clamp head in its operative position being constructed so as not to interfere with one another when said first carrier and said second carrier are moved back and forth;

said first support having an elongated arm extending over said second carrier;

said second clamp head being attached to said second swing base;

said first swing base and said second swing base being pivotably mounted respectively to a front end of said first support and said second support;

said second carrier including a pair of rod-like supports;

said first clamp head and said second clamp head being attached respectively to said first swing base and said second swing base; and

said second swing base being pivotably mounted to ends of said pair of rod-like supports.

2. Apparatus for pulling metal extruded from an extrusion machine, which comprises:

a runout table having a surface;

at least two carriers;

at least two heads for clamping said metal;

each of said at least two heads being mounted to a one of said at least two carriers;

each of said at least two heads being movable between an operative position and a retracted position;

means for guiding said at least two carriers along one side of said runout table and parallel thereto;

said means for guiding being mounted below said surface of said runout table, thereby providing working space thereabove;

said means for guiding being effective to keep a first of said at least two carriers with a first of said at least two heads in said operative position from interfering with a second of said at least two carriers with a second of said at least two heads in said retracted position when said first of said at least two carriers and said second of said at least two carriers are guided back and forth along said runout table.

3. Apparatus for pulling metal extruded from an extrusion machine, which comprises:

a runout table having a surface;

a first guide rail and a second guide rail mounted on one side of said runout table and extending in parallel thereto;

a first guide rail and said second guide rail being mounted below said surface of said runout table, thereby providing working space thereabove;

a first carrier and a second carrier;

said first carrier being movable on said first guide rail;

said second carrier being movable on said second guide rail;

a first clamp head and a second clamp head;

a first support and a second support;

a first swing base and a second swing base;

said first clamp being mounted to said first carrier through said first support said first swing base;

said said second clamp head being mounted to said second carrier through said second support and said second swing base;

each of said first clamp head and said second clamp head being movable between an operative position and a retracted position;

said first carrier with said first clamp head in its operative position and said second carrier with said second clamp head in its retracted position being constructed so as not to interfere with one another when said first carrier and said second carrier are moved back and forth; and

said first carrier with said first clamp head in its retracted position and said second carrier with said second clamp head in its operative position being constructed so as not to interfere with one another when said first carrier and said second carrier are moved back and forth;

4. Apparatus for pulling metal extruded from an extrusion machine as in claim **3**, wherein:

said first carrier includes a first air tank;

said second carrier includes a second air tank;

said first carrier includes a first plurality of cylinders connected to said first air tank;

said second carrier includes a second plurality of cylinders connected to said second air tank;

said first air tank being connected to a first air coupler for replenishment thereof;

said second air tank being connected to a second air coupler for replenishment thereof; and

each of said first plurality of cylinders is actuated by a mechanical valve, whereby said first swing base and said second swing base and said first clamp head and said second clamp head are further actuated.

5. Apparatus for pulling metal extruded from an extrusion machine as in claim **4**, wherein:

said first carrier includes a first rod;

said second carrier includes a second rod;

said first rod is slidably mounted;

said second rod is slidably mounted;

said first rod includes a first dog block;

said second rod includes a second dog block;

said first carrier being moved by a first drive wire;

said second carrier being moved by a second drive wire;

said first rod having opposite ends connected to said first drive wire, whereby movement of said first rod causes said first dog block to actuate said plurality of cylinders; and

said second rod having opposite ends connected to said second drive wire, whereby movement of said second rod causes said second dog block to actuate said plurality of cylinders.

6. Apparatus for pulling metal extruded from an extrusion machine as in claim **5**, wherein:

said first rod includes a first control block;

said second rod includes a second control block;

said first carrier includes a first stop lever and a second stop lever;

said second carrier includes a third stop lever and a fourth stop lever;

said first stop lever and said second stop lever cooperate to limit a range of motion of said first control blocks; and

said third stop lever and said fourth stop lever cooperate to limit a range of motion of said second control block.

7. Apparatus for pulling metal extruded from an extrusion machine as in claim **4**, wherein:

said first carrier includes a first arm and a first roller;

said second carrier includes a second arm and a second roller;

said first arm and said first roller cooperate to open and close said mechanical valve;

said second arm and said second roller cooperate to open and close said mechanical valve; and

said mechanical valve is mounted between a one of said first air tank and said second air tank and a one of said first and second plurality of cylinders.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 5,201,209

DATED : April 13, 1993

INVENTOR(S) : Masao HOUMURA, Mitsuo YASUI, Seizo WASHIZUKA, Norio FUTAKUCHI and Hitoshi MUKAIYAMA

It is certified that error appears in the above-indentified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page, item [73], add --Toyama Light Metal Industry Co., Ltd., Toyama, Japan--

Signed and Sealed this

Twenty-first Day of March, 1995

Attest:

BRUCE LEHMAN

Attesting Officer

Commissioner of Patents and Trademarks

[redacted]